

No. 5 — *Preliminary Report on the Echini collected in 1906, from May to December, among the Aleutian Islands, in Bering Sea, and along the coasts of Kamtchatka, Saghalin, Korea, and Japan, by the U. S. Fish Commission Steamer "Albatross," in charge of LIEUT. COMMANDER L. M. GARRETT, U. S. N., Commanding.* BY ALEXANDER AGASSIZ AND HUBERT LYMAN CLARK.

THE "Albatross" sailed from San Francisco *via* Seattle<sup>1</sup> to Dutch Harbor, Alaska; thence to the westward among the Aleutian Islands, swinging northward and back again to take in Bowers Bank in Bering Sea; from the end of the Aleutian chain northwestward to the Komandorski Islands, then to Petropaulovsk, Kamchatka; thence rounding the southern point of this peninsula and up its western coast to Lat.  $51^{\circ} 40'$ ; from this point southwestward to the Okhotsk Sea along the Kuril Islands to Hakodate, whence the course was taken along the western coast of Hondo, crossing the Sea of Japan to the Korean coast; thence zigzagging southward among the numerous islands at the lower end of the Japanese archipelago, including the northern Linschotens; northward along the eastern Japanese coast, through the Inland Sea and along the outer coast of Hondo again to Hakodate, thus completely circumnavigating Hondo and Kiushiu. From Hakodate the ship cruised northward, west of Hokkaido, up the western coast of Saghalin Island to Lat.  $47^{\circ} 40'$ ; returning and rounding the lower end of the island to Cape Patience, on the eastern side; from Cape Patience south again to the eastward of Hokkaido and back to Hakodate, returning thence to Yokohama, from which point, after a short cruise in Suruga and Sagami bays, the vessel sailed for San Francisco.

The collection of Echini made by the "Albatross" from May 3 to December 10, 1906, is interesting, as it connects the fauna of the deep waters of Alaska and off the Aleutian Islands with that of Japan. The collection from Japanese waters is important, as with those made by Döderlein, we now have a good representation of Japanese Echini living

<sup>1</sup> The route of the "Albatross" is taken from Dredging and Hydrographic Records of the U. S. Fisheries Steamer "Albatross," for the year 1906. Washington, 1907.

in moderate depths, *i. e.*, less than 1000 fathoms. The bulk of the collection from Japan is inside of 300 fathoms; at a few points only was the dredging carried below 700 fathoms. Consequently this collection, like that of Hawaiian Echini we have under examination, fails to connect the littoral with the deep sea fauna.

But as regards the so-called continental region, there are some interesting points of comparison between the Japanese, the Hawaiian, the Alaskan, and the Panamic faunae. In the Panamic fauna there are but few species which encroach on that region either from the North or the South; it has a most typical Echinid fauna connecting with the deep water and abyssal region in which we find the Cystechinidae, Urechinidae, Palaeopneustidae, Ananchytidae, and the like; the nearest relatives of the Panamic Echinid fauna being mainly Indo-Pacific and Pacific species of wide geographical range. We have already called attention to the geographical relation of the Echini collected<sup>1</sup> in the Hawaiian region, which are in the main Pacific and Indo-Pacific.

The Japanese collections indicate affinities with some of the Hawaiian Echini. The absence of *Cidaris* proper and of the widely spread species of Pacific *Echinometra*, like *E. mathaei*, *picta*, and *oblonga* and of *Diadema*, is quite striking. We have only *Dorocidaris* and *Stereocidaris* common to both the Hawaiian Islands and Japan. Of the *Salenidae* of Japan, one extends to Hawaii. A new species of *Coelopleurus* and the presence of *Aspidodiadema tonsum* indicates the East Indian affinities of Japan. Echinothuriæ are common in Japanese waters; one of the species of *Asthenosoma* is found in 39 fathoms; *Phormosoma* from 250 to 918, and *Sperosoma* from 500 to 1766 fathoms. One of the species of *Phormosoma* from Japan is also found at the Hawaiian Islands. The number of species of *Sperosoma* is remarkable. The species of Japanese *Strongylocentrotus* indicate northern Pacific affinities. The species of *Temnopleuridae* are either identical with (*Prionechinus*) or allied to (*Genocidaris*, *Pleurechinus*) East Indian species. The occurrence of *Hemipedinia mirabilis* and of *Phymosoma crenulare* is most interesting. The Japanese collections contain no *Hipponoë* and only one species of *Echinus*. It is, however, marked, as is the Hawaiian collection, by the number of its *Clypeastroids*, especially *Laganum* of East Indian types, and *Scutellidae* of Atlantic and northwestern Pacific genera.

A new *Echinolampas* has been obtained. The only *Pourtalesia* is *P. laguncula*, which, judging from some fragments, grows to a larger size than was previously known. In the deep waters of the Bering Sea and

<sup>1</sup> Bull. Mus. Comp. Zoöl., 1907, Vol. L, No. 8, p. 232.

off Japan were found *Urechinus* and *Cystechinus*, and among Palaeopneustidae one species of *Meijerea* is common to Bering Sea and the Hawaiian Islands. Among the Spatangina we find *Gymnopatagus*, *Lovenia*, and *Pseudolovenia*, both in Japan and the Hawaiian Islands. *Spatangus Lütkeni* of Japan is closely allied to *S. paucituberculatus* of the Hawaiian Islands. *Brissopsis Oldhami* and *luzonica* have a wide range including both Japan and the Hawaiian Islands, and the genus *Aeeste* is also common to both regions. It is interesting to note the occurrence of two species of *Echinocardium*, of *Hemiaster* and of *Periaster*; the last genus is also found in the Hawaiian Islands. A striking difference between the Japanese and Hawaiian faunae is seen in the abundance of *Schizasters* in the former region and their almost complete absence in the latter. While our Hawaiian collection contains only a single, very small specimen, there are several hundred in the collection from Japan.

It may be of interest to note that of the 49 genera taken by the "Albatross" in the Hawaiian region, only 20 were taken also in Japanese waters, and of the 67 species, only 9 are in the Japanese collection.

## DESMOSTICHA HAECKEL.

### CIDARIDAE MÜLLER.

#### *Dorocidaris Reini* DÖD.

*Cidaris (Dorocidaris) Reini* Döderlein, 1887. Jap. Seeigel, p. 7; Taf. 4, figs. 1-7, Taf. 8, figs. 4a-d.

There is a single adult specimen from station 4933. We also refer to this species two young *Cidaridae*, one 9, the other 13 mm. in diameter, from station 4936. These individuals are remarkable for their short, stout primary spines, which only about equal the diameter of the test and are noticeably swollen above the neck. They are provided with ten or twelve longitudinal ridges but these are not at all serrate, nor is there any indication of granules or prickles anywhere on the spine. These peculiar primaries are yellowish-white, tipped with brown and with two broad ridges of the same color. They are unlike the spines of any *Cidaroid* which we have seen and it is possible that the two specimens are really the young of an hitherto undescribed species.

Station 4933. Off Kagoshima Gulf, Japan, 152 fathoms.

" 4936. Off Kagoshima Gulf, Japan, 103 fathoms.

Three specimens.

**Stereocidaris microtuberculata** Yosh.

*Cidaris (Stereocidaris) microtuberculatus* Yoshiwara, 1898. *Ann. Zoöl. Jap.*, **2**, p. 57.

There is a single specimen of this species, which is notable for its large size. The horizontal diameter measures 86 mm., which is considerably more than that of any specimen of *Stereocidaris* hitherto recorded. Yoshiwara's largest specimen of this species measured 66 mm. As the pedicellariae have never been described, it may be said here that they are very similar to those of *S. leucacantha* A. Ag. and Cl. and cannot be distinguished from them with certainty. The globiferous, both large and small, are very abundant, but the tridentate seem to be very rare.

Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.

One specimen.

**Stereocidaris sceptriferoides** Döder.

*Cidaris (Stereocidaris) sceptriferoides* Döderlein, 1887. *Jap. Seeigel*, p. 5, *Taf. 2*, figs. 12-17, *Taf. 8*, figs. 3a-e.

This rare species is represented by a single small specimen, which agrees well with Döderlein's description and figures, except that the secondaries are not pure white but are tinged with brown, and the test is distinctly brown. Döderlein's figures of the pedicellariae, although not incorrect, do not do justice to their remarkably slender form. Moreover, in many of them the valves have a conspicuous unpaired end tooth and the opening is about one-third of the length. They are thus almost identical with those Mortensen figures as characteristic of his new genus, *Schizocidaris*. 1903, *Ingolf Exp. Ech.*, Pt. I, Pl. 10, figs. 25 and 28. If that genus is to be recognized, this species must certainly be placed in it, although it is in other respects very evidently a *Stereocidaris*.

Station 4968. Between Kobe and Yokohama, Japan, 253 fathoms.

One specimen.

**Anomocidaris japonica** A. Ag. and Clark.

*Dorocidaris japonica* Döderlein, 1885. *Arch. f. Naturg.*, **51**, Bd. 1, p. 76.

*Cidaris (Stereocidaris) japonica* Döderlein, 1887. *Jap. Seeigel*, p. 6, *Taf. 3*, figs. 1-20; *Taf. 8*, figs. 1a-h.

*Cidaris (Stereocidaris) tenuispinus* Yoshiwara, 1898. *Ann. Zoöl. Jap.*, **2**, p. 57.

*Anomocidaris tenuispina* A. Agassiz and Clark, 1907. *Haw. Pacif. Ech. Cid.*, p. 30; Pl. 11, figs. 6-12, Pl. 12, figs. 18-30, Pl. 31, figs. 5-8.

A large series of this interesting species was taken and we are therefore able to give additional information about it. The conical form of the test shown by the single specimen formerly at our disposal is not characteristic but is found to a greater or less degree in several individuals, none of which, however, are fully grown. The large specimens all have the rounded abactinal surface figured by Döderlein for *japonica* and a careful comparison of Döderlein's description and



figures with Yoshiwara's description and with our numerous specimens, ranging from 11 to 40 mm. in diameter, has satisfied us that *japonica* and *tenuispina* are identical. But we retain the genus *Anomocidaris* on account of the bare abactinal surface, which is different from that of any other Echinoid in the absence of primary tubercles on the upper coronal plates. In small examples of *Stereocidaris* and other *Cidaridae*, on the youngest coronal plate, next to the abactinal system, a primary tubercle is formed which increases in size with the growth of the plate and sooner or later bears a primary spine; in the adult, therefore, the uppermost coronal plate has an imperfect tubercle, the second has a more perfect tubercle which usually carries a spine and the third always has a primary spine. In small examples of *Anomocidaris* (11 mm. in diameter), there are six coronal plates, of which the uppermost has a well-formed tubercle and the other five carry primary spines, that on the second plate being the longest. As the animal grows, additional plates form abactinally but these have no primary tubercles and often scarcely an areola, while the spineless tubercle on the plate above the longest spine appears to be gradually more or less resorbed. In large specimens there are usually eight, and may be as many as nine, coronal plates, of which the five or six nearest the actinostome carry primaries, while the remaining two or three have no tubercles and only indications of small areolae. As the actinal coronal plates are small and crowded while those on the abactinal surface are very large, the spines are all actinal in position, except the longest which are just at the ambitus. Consequently the abactinal surface is extraordinarily bare, and the genus *Anomocidaris* is therefore easily recognized. — The primary spines are more slender than in *Stereocidaris* but show considerable diversity. They frequently taper to the very tip but are often more or less flaring there, and occasionally, in large specimens, are distinctly flattened and slightly widened at the extremity. They are grayish or brownish in color, often with a decidedly olive-green, very rarely a rosy-red, cast; the neck is brown, usually polished and shining, while the narrow collar is commonly dirty whitish, but may be darker than the neck. The primaries around the actinostome show the greatest diversity. In the smallest specimens, they are white, flat, curved at the tip, and distinctly serrate, exactly as Döderlein figures them for *japonica*, but in the large specimens they are dull gray, but little flattened, not at all curved, and with no trace of serrations. Intermediate conditions between the two extremes are common, and the differences appear to be due to age. — The pedicellariae are equally variable, for on some specimens, the large globiferous, such as Döderlein figures for *japonica*, are very common, on others they are rare and on others they seem to be wholly wanting. The diversity of the small globiferous pedicellariae has already been shown by us in "Hawaiian and Pacific Echini: *Cidaridae*," Plate 11, figs. 6-12 and Plate 12, fig. 18. They intergrade with the large globiferous pedicellariae quite imperceptibly. Tridentate pedicellariae appear to be always absent. — The color of the test and small spines also reveals some diversity. The test is commonly reddish-brown, but it may be greenish or not infrequently dirty whitish; it is almost always darkest abactinally. The small spines are usually distinctly greenish, more or less decidedly lighter on the edges than at the middle, but they may be

simply dirty whitish or have a reddish cast; they are decidedly brightest on the bare abactinal surface, where they are noticeably small but fairly abundant.

- Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.  
 " 4808. Between Hakodate and Sado Island, Japan, 47 fathoms.  
 " 4815. Between Hakodate and Sado Island, Japan, 70 fathoms.  
 " 4817. Between Hakodate and Sado Island, Japan, 61 fathoms.  
 " 4832. Between Nanao and Tsuruga, Hondo, Japan, 76-79 fathoms.  
 " 4833. Between Nanao and Tsuruga, Hondo, Japan, 79 fathoms.  
 " 4842. Between Dogo Island and Matsushima, Japan, 82 fathoms.  
 " 4876. Eastern Channel, Korea Strait, 59 fathoms.  
 " 5092. Uraga Strait, Gulf of Tokyo, 70 fathoms.  
 " 5094. Uraga Strait, Gulf of Tokyo, 88 fathoms.

Forty-nine specimens.

### *Goniocidaris biserialis* DÖD.

*Stephanocidaris biserialis* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 79.

*Goniocidaris biserialis* Döderlein, 1887. Jap. Seeigel, p. 10. Taf. 5; Taf. 8, fig. 8.

A very good series of this species was taken, ranging in size from 7 to 27 mm. The color shows considerable diversity, as the test and small spines may be yellow, olive-green, brown, or brownish-red. The primaries are uniformly dull, but they are more or less encrusted with sponges, bryozoans, worm-tubes, etc., and the color is thus often considerably modified.

- Station 4875. Eastern channel, Korea Strait, 59 fathoms.  
 " 4876. Eastern channel, Korea Strait, 59 fathoms.  
 " 4877. Eastern channel, Korea Strait, 59 fathoms.  
 " 4879. Eastern channel, Korea Strait, 59 fathoms.  
 " 4893. Southwest of Goto Islands, Japan, 95-106 fathoms.  
 " 4894. Southwest of Goto Islands, Japan, 95 fathoms.  
 " 4895. Southwest of Goto Islands, Japan, 95 fathoms.  
 " 4936. Off Kagoshima Gulf, Japan, 103 fathoms.

Thirty-six specimens.

### *Goniocidaris clypeata* DÖD.

*Goniocidaris clypeata* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 82.

A good series of this curious species, ranging from 7 to 20 mm. in diameter, was taken, some of which are remarkably like some specimens of *florigera*. There seem to be, however, constant differences between the two species. The remarkable diversity revealed by the primary spines of these specimens is noteworthy, for some are tapering, only slightly thorny, and not at all expanded at either base or tip (young spines may even be perfectly smooth and tapering), while others, more or less conspicuously prickly, are expanded either at the base or at the tip or at both, and all kinds of intermediate types occur. The color of the test is usually reddish-brown, but may be much lighter. The secondary spines are light brownish. The primaries are gray

or whitish or even bright rose-red. The tuberculation of the median ambulacral area varies greatly; for, while in most specimens, each plate carries two or three small tubercles in addition to the large marginal one, so that the appearance of the area is much like that of *florigera*, in other specimens the middle of each ambulacrum is more or less sunken and bare as in *tubaria*; the two extremes, however, intergrade very evidently.

Station 4891. Southwest of Goto Islands, Japan, 181 fathoms.

“ 4900. Southwest of Goto Islands, Japan, 139 fathoms.

“ 4933. Off Kagoshima Gulf, Japan, 152 fathoms.

“ 5091. Uraga Strait, Gulf of Tokyo, 197 fathoms.

“ 5094. Uraga Strait, Gulf of Tokyo, 88 fathoms.

Niue specimens.

### *Goniocidaris mikado* DÖD.

*Discocidaris (Cidaris) mikado* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 80.

*Goniocidaris mikado* Döderlein, 1887. Jap. Seeigel, p. 15, Taf. 7; Taf. 8, figs. 6, 9-18.

A small series of this species is in the collection, ranging from 8 to 21 mm. in diameter. Specimens at any age are readily recognized by the remarkable, very small, nearly spherical miliary spines. The color, very light fawn, nearly cream-white, shows little variety.

Station 4893. Southwest of Goto Islands, 95-106 fathoms.

“ 4894. Southwest of Goto Islands, 95 fathoms.

“ 4895. Southwest of Goto Islands, 95 fathoms.

“ 5070. Suruga Gulf, Japan, 108 fathoms.

Nine specimens.

### *Aporocidaris fragilis* A. AG. and CL.

*Aporocidaris fragilis* A. Agassiz and Clark, 1907. Haw. Pacif. Ech. Cid., p. 37, Pl. 10, figs. 10-21; Pl. 23, figs. 5-8.

There is an excellent series of this species now available, ranging from 8 to 23 mm. in diameter, but there is little to add to our original description. The differences between *fragilis* and *Milleri* appear to be constant, and little diversity is shown. The color of these specimens differs from that of the type in being reddish rather than yellowish-brown; it is considerably darker than in *Milleri*.

Station 4761. South of Shumagin Islands, Alaska, 1973 fathoms.

Twenty-five specimens.

## SALENIDAE AGASSIZ.

### *Salenia miliaris* A. AG.

*Salenia miliaris* A. Agassiz, 1898. Bull. M. C. Z., 32, p. 74, Pl. 2, figs. 2-4.

Two large specimens, about 17 mm. in diameter, are the only representatives of this species in the collection.

Station 5084. Off Omai Saki Light, Japan, 918 fathoms.

Two specimens.

*Salenia cincta* A. Ag. and CLARK.

This handsome species is closely related to *Pattersoni* A. Ag., but is easily distinguished by the coloration. The test and secondaries, and especially the abactinal system, are deep purple or greenish more or less tinged with purple. The primaries are white, more or less distinctly shaded with green on the upper side, with 12 to 16 broad rings of dull red. The sculpturing of the abactinal system is quite different from that of *Pattersoni*, and tridentate pedicellariae seem to be wanting. The largest specimen is 12 mm. in diameter, and the longest primaries measure 52 mm. The latter are very slender, scarcely a millimeter in diameter, and are distinctly verticillate, though nearly smooth.

Station 4893. Southwest of Goto Islands, Japan, 95-103 fathoms.

“ 4894. Southwest of Goto Islands, Japan, 95 fathoms.

“ 4895. Southwest of Goto Islands, Japan, 95 fathoms.

“ 4934. Off Kagoshima Gulf, Japan, 103-152 fathoms.

“ 4936. Off Kagoshima Gulf, Japan, 103 fathoms.

Twelve specimens.

## ARBACIADAE GRAY.

*Coelopleurus maculatus* A. Ag. and CLARK.

The specimens of *Coelopleurus* in the collection show no diversity in color or other features, and are strikingly handsome, with polished green primary spines conspicuously spotted on the upper side with scarlet red. The lower side is white, with somewhat indistinct red markings, as though the spots on the upper side showed through. Towards the tip of the spine, on the upper side, the red spots become confluent, so that the distal part of the spine is red for a greater or less distance, though it may be tipped with green or white. The primary spines are sharply triangular, especially near the base, and are distinctly curved towards the tip. The collar is short, rarely over five millimeters in length, dull and usually rough with four or five longitudinal series of coarse granules, on each side. The small actinal primary spines are flat and smooth, pure white, with very conspicuous gray collars extending half their length. — These specimens agree perfectly with the specimens taken by the “Challenger” at Amboina, and with others in the Museum collection from Uruga Channel, Japan, hitherto referred to *C. Maillardi*. It seems to be necessary, however, to distinguish them from that species, for in the type specimen of *Maillardi* from Bourbon, the primary spines are marked with deep purple and the collar is 8 mm. in length, and very finely and uniformly granular. Moreover, the secondary spines in *maculatus* are stout and blunt, rarely having a sharp point, while in *Maillardi* they are strikingly acicular. The largest specimen of *maculatus* before us measures 37 mm. in diameter; the primaries are all broken, but in other specimens they are three or four times the diameter of the test.

Station 4881. Eastern channel, Korea Strait, 40-59 fathoms.

“ 4937. Off Kagoshima Gulf, Japan, 58 fathoms.

Five specimens.

## ASPIDIADIEMATIDAE DUNCAN.

*Aspidodiadema tonsum* A. Ag.

*Aspidodiadema tonsum*, A. Agassiz, 1879. Proc. Amer. Acad., **14**, p. 199.

The specimens taken agree more nearly with the *Aspidodiademas* taken by the "Challenger" off Cebu, than with those (*nicobaricum*) in our Hawaiian collection.

Station 4980. Between Kobe and Yokohama, Japan, 507 fathoms.

" 5078. Off Omai Saki Light, Japan, 475-514 fathoms.

" 5079. Off Omai Saki Light, Japan, 475-505 fathoms.

" 5080. Off Omai Saki Light, Japan, 505 fathoms.

Fifteen specimens.

## ECHINOTHURIDAE WYVILLE THOMSON.

*Asthenosoma pellucidum* A. Ag.

*Asthenosoma pellucidum* A. Agassiz, 1879. Proc. Amer. Acad., **14**, p. 200.

The specimens are all small, less than 50 mm. in diameter, and their color is darker than that of "Challenger" specimens, but otherwise they are not peculiar.

Station 4934. Off Kagoshima Gulf, Japan, 103-152 fathoms.

Three specimens.

*Asthenosoma Owstoni* A. Ag. and CLARK.

*Araeosoma Owstoni* Mortensen, 1904. Ann. Mag. Nat. Hist., (7) **14**, p. 82, Pl. 2, Pl. 5, figs. 4-9, 11, 18-20.

The specimens before us range in size from 20 to 150 mm., and agree well in all particulars with Mortensen's description, though they show a greater diversity in color. They vary from almost white (the smallest specimens) to nearly brick-red, but the largest specimens are dull, pale purplish. The actual primary spines are decidedly pinkish, while those on the abactinal surface show only a very slight greenish tinge. The pedicellariae agree entirely with Mortensen's figures.

Station 4875. Eastern channel, Korea Strait, 59 fathoms.

" 4876. Eastern channel, Korea Strait, 59 fathoms.

" 4877. Eastern channel, Korea Strait, 59 fathoms.

" 4946. Between Kagoshima and Kobe, Japan, 39 fathoms.

" 5095. In Uraga Straits, Gulf of Tokyo, 58 fathoms.

Ten specimens.

*Asthenosoma tessellatum* A. Ag.

*Asthenosoma tessellata* A. Agassiz, 1879. Proc. Amer. Acad., **14**, p. 201.

The single specimen, 140 mm. in diameter, is somewhat damaged, but agrees very well with the "Challenger" specimen, which was taken near Manila.

Station 4943. In Kagoshima Gulf, Japan, 119 fathoms.

One specimen.

***Asthenosoma bicolor* A. Ag. and CLARK.**

This species is apparently nearly related to *Owstoni*, but differs in color and in certain features of the test. The coronal plates are low and very numerous, 44 in the interambulacra and 75 in the ambulacra; in *Owstoni* of the same size (125 mm.), the numbers are 38 and 60 respectively. The test is more flexible abactinally than in *Owstoni*, and the bare median ambulacral and interambulacral areas are more marked. The test and spines are dull yellowish actinally, while on the abactinal surface the interambulacra are chiefly yellow and the ambulacra are dull violet. These colors are not sharply defined, but contrast with each other nevertheless. The genital plates in *bicolor* are not so elongated as in *Owstoni*, for they separate only the first pair of interambulacral plates and touch the second, while in *Owstoni* they separate the first two pairs and touch, sometimes nearly separating, the third. In *bicolor*, four of the genitals are remarkable in that the outer part of the plate (*i. e.*, the part distal to the pore) is separated by a regular suture from the remainder of the genital, and thus is a perfectly distinct plate. The pedicellariae of *bicolor* appear to be identical with those of *Owstoni*.

Station 4939. In Kagoshima Gulf, Japan, 85 fathoms.

One specimen.

***Asthenosoma pyrochloa* A. Ag. and CLARK.**

This handsome species is very nearly related to the Atlantic species *hystrix*, and is only to be distinguished by the color and some differences in the arrangement of the primary tubercles. The entire test is of a most brilliant vermilion-red, strikingly different from the rich rose-red of *hystrix*. In the ambulacra, on the actinal side, there are two distinct vertical series of tubercles, beginning near the peristome and running nearly or quite to the ambitus. These series lie near together in the median ambulacral area, and on the outer side of each is a shorter and less complete series. In the interambulacra we find very regular series running along the margins close to the ambulacra, and in each area there is a second series on the inner ends of the interambulacral plates. Each plate also carries, not infrequently, one or two additional tubercles. Abactinally each interambulacral plate carries two and often three large tubercles. The secondary and miliary spines are much coarser, and possibly more numerous, than in *hystrix*, so that the general appearance, especially of the abactinal surface, is rather different. The largest specimen is about 190 mm. in diameter.

Station 4919. Off Kagoshima Gulf, Japan, 440 fathoms.

“ 5083. Off Omai Saki Light, Japan, 624 fathoms.

Three specimens.

***Phormosoma bursarium* A. Ag.**

*Phormosoma bursarium* A. Agassiz, 1881. Rept. Chall. Eeh., p. 99, Pl. 10 b.

Although these specimens from the northwestern Pacific show such diversity among themselves that they can be divided into two groups, and although neither of



these groups is wholly like the Hawaiian Island form, collected by the "Albatross" in 1902, nevertheless it does not seem to be practicable to distinguish more than a single species. A large proportion of the present collection is made up of young specimens, under 30 mm. in diameter, but the individuals range from 20 to 110 mm.

- Station 4906. Southwest of Koshika Islands, Japan, 369-406 fathoms  
 " 4907. Southwest of Koshika Islands, Japan, 406 fathoms.  
 " 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4912. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4913. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4914. Southwest of Koshika Islands, Japan, 427 fathoms.  
 " 4915. Southwest of Koshika Islands, Japan, 427 fathoms.  
 " 4957. Between Kagoshima and Kobe, Japan, 437 fathoms.  
 " 4968. Between Kobe and Yokohama, Japan, 253 fathoms.  
 " 4969. Between Kobe and Yokohama, Japan, 587 fathoms.  
 " 5078. Off Omai Saki Light, Japan, 475-514 fathoms.  
 " 5082. Off Omai Saki Light, Japan, 662 fathoms.  
 " 5084. Off Omai Saki Light, Japan, 918 fathoms.  
 " 5086. Sagami Bay, Hondo, Japan, 292 fathoms.  
 " 5088. Sagami Bay, Hondo, Japan, 369-405 fathoms.

Thirty specimens.

#### *Phormosoma hoplacantha* WYV. THOMS.

*Phormosoma hoplacantha* Wyville Thomson, 1877. Voy. Chall. Atlantic, 1, p. 148, fig. 35.

A fairly good series of a *Phormosoma*, which seems to be identical with the "Challenger" specimens of *hoplacantha*, was taken at the following stations.

- Station 4923. In Colnett Strait, Japan, 1003 fathoms.  
 " 4956. Between Kagoshima and Kobe, Japan, 720 fathoms.  
 " 4958. Between Kagoshima and Kobe, Japan, 405 fathoms.  
 " 4973. Between Kobe and Yokohama, Japan, 600 fathoms.  
 " 4980. Between Kobe and Yokohama, Japan, 507 fathoms.  
 " 5078. Off Omai Saki Light, Japan, 475-514 fathoms.  
 " 5080. Off Omai Saki Light, Japan, 505 fathoms.  
 " 5082. Off Omai Saki Light, Japan, 662 fathoms.  
 " 5084. Off Omai Saki Light, Japan, 918 fathoms.  
 " 5086. Sagami Bay, Hondo, Japan, 292 fathoms.

Thirteen specimens.

#### *Phormosoma tenue* A. Ag.

*Phormosoma tenue* A. Agassiz, 1879. Proc. Amer. Acad., 14, p. 202.

The specimens referred to this species are of interest from having ophicephalous pedicellariae in addition to the characteristic tridentate ones. As Döderlein (1906,

Valdivia Echini, p. 121), has suggested, ophicephalous pedicellariae probably occur in most if not all of the genera proposed by Mortensen. Those of *tenue* are very similar to those figured by Döderlein for *Sperosoma durum*. — The color of the "Albatross" specimens is violet above, becoming deep reddish-purple actinally, while the "Challenger" specimens were "yellowish-gray," but in the general appearance and the arrangement of the tubercles there seem to be no important differences between the two series.

Station 4928. In Colnett Strait, Japan, 1008 fathoms.

" 5084. Off Omai Saki Light, Japan, 918 fathoms.

Four specimens.

### *Sperosoma quincunciale* DE MEIJER.

*Sperosoma quincunciale* de Meijere, 1904. Ech. Siboga-Exp., p. 40, Pl. 13, figs. 166-176.

A number of Echinothurids, closely resembling *P. tenue*, prove on careful examination to be *Sperosomas*, which we are unable to distinguish from *quincunciale*, though none of the specimens is as large as de Meijere's type. They range from 45 mm. to 170 mm. in diameter and are all more or less deep violet in color. The actinal primary spines are provided with large and conspicuous white "hoofs." The arrangement of the ambulacral pores abactinally is very characteristic.

Station 4957. Between Kagoshima and Kobe, Japan, 437 fathoms.

" 5079. Off Omai Saki, Japan, 475-505 fathoms.

" 5080. Off Omai Saki, Japan, 505 fathoms.

Eight specimens.

### *Sperosoma biseriatum* DÖB.

*Sperosoma biseriatum* Döderlein, 1901. Zool. Anz., 23, p. 20.

We refer to this species, but not without some hesitation, a badly mutilated specimen of *Sperosoma*, easily distinguished from the preceding by the arrangement of the ambulacral pores abactinally, which are just as Döderlein (1906, p. 152; Pl. 19, fig. 1) describes and figures them for *biseriatum*. The color and the pedicellariae show slight differences, however, for the test of this specimen was obviously deep purple, and the valves of the pedicellariae have a straight, smooth margin. It is quite possible that this specimen really represents an undescribed species.

Station 4766. Between Atka Island and Bowers Bank, Bering Sea, 1766 fathoms.

One specimen.

### *Sperosoma giganteum* A. AG. and CLARK.

This remarkable Echinothurid measures nearly 320 mm. in its greatest horizontal diameter. The color is very deep purple, almost black when in shadow. The ambulacra are extraordinarily wide, for on the abactinal surface just above the ambitus they measure over 100 mm. while the interambulacra are little over 70. The outer and inner columns in each half of each ambulacrum are made up of re-

markably long, low plates, which just above the ambitus are 25 mm. long and only 5 mm. high. There are no primary tubercles above the ambitus but the whole abactinal surface is rather closely covered with slender secondaries and miliaries. On the actinal surface, primary spines are fairly numerous but show no regular arrangement. Many ambulacral plates have two, and many interambulacral plates four spines. The areolae are small, the diameter usually less than half the height of the plate. The primary spines are seldom 25 mm. long and terminate in a conspicuous white hoof; nearly all are, however, broken off. The pedicellariae are interesting, for in addition to tridentate pedicellariae, similar to those of *Sperosoma biserialum* Död., but seldom with valves as much as two millimeters long, we find ophicephalous and triphyllous pedicellariae abundant. The latter are not peculiar but the former are almost exactly like those figured by Mortensen (1903, Pl. 14, fig. 23) as characteristic of his proposed new genus "Tromikosoma"! In no other respect, however, does this species resemble that group. Unfortunately only one specimen of this interesting Echinothurid was taken.

Station 5082. Off Omai Saki Light, Japan, 662 fathoms.

One specimen.

#### ECHINOMETRIDAE GRAY.

##### *Strongylocentrotus Dröbachiensis* A. Ag.

*Echinus Dröbachiensis* O. F. Müller, 1776. Prod. Zool. Dan., p. 235.

*Strongylocentrotus Dröbachiensis* A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 162.

A considerable number of specimens of *Strongylocentrotus* were collected along the North American coast from British Columbia northwestward, across the Pacific. They show little diversity among themselves and only very slight, if any, differences from specimens collected at Eastport, Maine. For the present at least they may be considered as *Dröbachiensis*.

Bayle Island, British Columbia.

Unalaska, Aleutian Islands.

Atka, Aleutian Islands.

Agattu, Aleutian Islands.

Medni, Komandorski Islands.

Bering, Komandorski Islands.

Petropaulovsk, Siberia.

Forty-three specimens.

##### *Strongylocentrotus nudus* A. Ag.

*Toxocidaris nuda* A. Agassiz, 1863. Proc. Acad. Nat. Sci., Phila., p. 356.

*Strongylocentrotus nudus* A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 165.

A single immature specimen, only 23 mm. in diameter, seems to be the young of this species, for the arcs of 6 or 7 pairs of pores are nearly vertical and the poriferous zones are correspondingly narrow. The primary tubercles are conspicuous while the other tubercles are few in number and small. The abactinal ambu-

lateral plates show radiating lines on the outer half, corresponding in number to the pairs of pores, as in larger specimens of *nudus*. The test is dull purplish with an evident greenish cast abactinally, and the primary spines and secondaries are more or less greenish. The color is thus quite unlike that of adult *nudus*.

Station 5018. Off Cape Tonin, Saghalin Island, 100 fathoms.

One specimen.

### **Strongylocentrotus tuberculatus Br.**

*Echinus tuberculatus* Lamarck, 1816. Anim. s. Vert., 3, p. 50.

*Strongylocentrotus tuberculatus* Brandt, 1835. Prod. Desc. Anim., p. 264.

The specimens are all (except one) large and of a very deep reddish-purple color. Hakodate.

Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.

Six specimens.

### **Strongylocentrotus echinoides A. Ag. and CLARK.**

It is hard to believe that a littoral Echinoid as common as this species seems to be, and as conspicuous, is still undescribed, but we are entirely at a loss in the attempt to assign it to any known species. The specimens range from 10 to 72 mm. in diameter. The general appearance and coloration in most of the adults, are quite like an *Echinus*, but the arrangement of the pores, in arcs of seven pairs (six in small specimens) is like *Strongylocentrotus*, and the pedicellariae of all four kinds are scarcely distinguishable from those of *Dröbachiensis*. The height of the test varies greatly, ranging from .45 of the diameter to .55. The color is equally variable but the test is more or less reddish-white, darkest on the abactinal median interambulacral areas which may be even deep reddish-purple. The small spines are light greenish, but the primaries show considerable diversity. They are commonly dull reddish at the base, becoming very light greenish at the tip, but in some cases, they are wholly green and in others, wholly light red. They are rather long (10-15 mm.), slender and pointed, but not at all numerous. In each interambulacrum, there are two vertical series of 12-20 large tubercles, each of which is flanked on each side by a less regular row of much smaller tubercles. In each ambulacrum, the median area is bounded on each side by a series of 18-30 tubercles, slightly smaller than the largest of those in the interambulacra, and between these two series are two less complete rows of much smaller tubercles. The secondary and miliary spines are very numerous, but are much shorter than the primaries. The abactinal system is small (about .20 of the diameter) and the two posterior ocular plates are in broad contact with the anal system. Pedicellariae, particularly the globiferous ones, are very numerous, and the tridentate are often two millimeters long, not including the stalk.

Station 4777. Petrel Bank, Bering Sea, 43-52 fathoms.

" 4778. Petrel Bank, Bering Sea, 33-43 fathoms.

" 4779. Petrel Bank, Bering Sea, 54-56 fathoms.

" 4782. Off East Cape, Attu Island, Aleutians, 57-59 fathoms.

" 4784. Off East Cape, Attu Island, Aleutians, 135 fathoms.

- Station 4786. Between Medni and Bering, Komandorski Islands, 54 fathoms.  
 " 4787. Between Medni and Bering, Komandorski Islands, 54-57 fathoms.  
 " 4788. Between Medni and Bering, Komandorski Islands, 56-57 fathoms.  
 " 4789. Between Medni and Bering, Komandorski Islands, 56 fathoms.  
 " 4790. Between Medni and Bering, Komandorski Islands, 64 fathoms.  
 " 4791. Between Medni and Bering, Komandorski Islands, 72-76 fathoms.  
 " 4792. Between Medni and Bering, Komandorski Islands, 72 fathoms.  
 " 4794. Off east coast of Kamchatka, 58-69 fathoms.  
 " 4795. Off east coast of Kamchatka, 48-69 fathoms.  
 " 4796. Off east coast of Kamchatka, 48 fathoms.  
 " 4804. Off Simushir Island, 229 fathoms.  
 " 4810. Between Hakodate and Sado Island, Japan, 90-195 fathoms.  
 " 4822. Between Nanao and Tsuruga, Hondo, Japan, 130 fathoms.  
 " 4982. Between Hakodate and Otaru, Hokkaido, Japan, 390-428 fathoms.  
 " 4987. Between Hakodate and Otaru, Hokkaido, Japan, 59 fathoms.  
 " 4993. Between Otaru, Hokkaido, and Korsakov, Saghalin, 142 fathoms.  
 " 4996. Between Otaru, Hokkaido, and Korsakov, Saghalin, 86 fathoms.  
 " 5016. Off eastern coast, southern end of Saghalin, 64 fathoms.  
 " 5041. Off southern coast of Hokkaido, Japan, 61-140 fathoms.  
 " 5048. Between Hakodate and Yokohama, Japan, 129 fathoms.  
 " 5049. Between Hakodate and Yokohama, Japan, 182 fathoms.

One hundred and sixty-two specimens.

#### **Strongylocentrotus polyacanthus** A. AG. and CLARK.

While the specimen to which we have given this name may prove to be an aberrant example of either *Dröbachiensis* or *purpuratus*, it seems best to recognize it now as a distinct species. It may be distinguished by the very numerous short spines, the primaries little exceeding the secondaries in either length (6-8 mm.) or thickness; the numerous (25) coronal plates; and the color. The test is 73 mm. in diameter and both it and the spines are dull rose-purple. The pairs of pores are in oblique, but little curved, arcs of six. Each coronal plate at the ambitus carries 3-5 primary, 25-35 secondary, and 50-60 military tubercles.

Milne Bay, Simushir Island, Kuril Islands, Japan.

One specimen.

#### **Strongylocentrotus pulchellus** A. AG. and CLARK.

Although the genital pores are large, it is doubtful whether even the larger of our two specimens is adult, as it is only 17 mm. in diameter. But there can be

little question that they represent an undescribed species, for the arrangement of the pores is very characteristic. The pairs are in very oblique, somewhat curved arcs of five, divided by a secondary tubercle into an inner group of two, and an outer, lower group of three pairs. The vertical series of secondary tubercles thus divides the poriferous zone into an inner and an outer band, the latter somewhat the wider. The globiferous pedicellariae are also very unique, for the expanded basal part of each valve is very wide, .60 of the length of the valve, and the terminal tooth is very long, .25-.35 of the valve length. Tridendate pedicellariae appear to be wanting. The test is very light purplish, noticeably darker abactinally, particularly on the median interambulaeal areas; on and around the abactinal system there is a very evident green tinge. The primary spines are light purple, rather abruptly tipped with whitish. The smaller spines are very much lighter. In the smaller specimen (9 mm.), the primary spines are purplish only at base, the terminal part being light greenish and the arcs of pore-pairs are nearly vertical above the ambitus and are uninterrupted.

Station 4794. Off east coast of Kamchatka, 58-69 fathoms.

“ 5003. Off southwestern coast of Saghalin Island, 35-38 fathoms.

Two specimens.

### TEMNOPLEURIDAE DESOR.

#### *Temnopleurus Reynaudi* AGASS.

*Temnopleurus Reynaudi* Agassiz, 1846. Ann. Sci. Nat., 6, p. 360.

The specimens taken by the “Albatross” are all small (9-23 mm.) and show no little diversity. The test is thin and the spines are long and slender. The depth of the pits varies greatly in different specimens, in some cases being so shallow as to be scarcely noticeable. The proportion of height to diameter is also variable, ranging from 40 to 55 per cent. The color of the test varies from dull purple, lighter on the poriferous zones, to yellowish-white, blotched around the abactinal system with red, green, purplish, or brown. The spines are brownish, purplish, greenish or dirty white, sometimes much lighter at base than at tip.

Station 4815. Between Hakodate and Sado Island, Japan, 70 fathoms.

“ 4832. Between Nanao and Tsuruga, Hondo, Japan, 76-79 fathoms.

“ 4893. Southwest of Goto Islands, Japan, 95-106 fathoms.

“ 4894. Southwest of Goto Islands, Japan, 95 fathoms.

“ 4895. Southwest of Goto Islands, Japan, 95 fathoms.

“ 4902. Southwest of Goto Islands, Japan, 139 fathoms.

“ 4904. Southwest of Goto Islands, Japan, 107 fathoms.

“ 4931. In Colnett Strait, Japan, 83 fathoms.

“ 4933. Off Kagoshima Gulf, Japan, 152 fathoms.

“ 5074. In Suruga Gulf, Japan, 47 fathoms.

“ 5095. Off Gulf of Tokyo, Japan, 58 fathoms.

Seventeen specimens.



**Temnopleurus toreumaticus** AGASS.

*Cidaris toreumatica* Klein, 1734. Nat. Disp. Ech., p. 22, Pl. 10, fig. E.

*Temnopleurus toreumaticus* Agassiz, 1841. Mon. d'Ech., Obs., p. 7.

There is only a single specimen of this well-known species, taken at Nanao Beach, Japan.

**Salmacopsis olivacea** DÖD.

*Salmacopsis olivacea* Döderlein, 1885. Arch. f. Naturg., Jahrg., 51, Bd. 1, p. 93.

These specimens differ from Döderlein's in their larger size and decidedly greener color. The largest are over 25 mm. in diameter.

Station 4894. Southwest of Goto Islands, Japan, 95 fathoms.

" 4937. In Kagoshima Gulf, Japan, 58 fathoms.

Five specimens.

**Pleurechinus variabilis** DÖD.

*Pleurechinus variabilis* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 90.

The specimens are small (8-11 mm.) and show little diversity.

Station 4893. Southwest of Goto Islands, Japan, 95-106 fathoms.

" 4894. Southwest of Goto Islands, Japan, 95 fathoms.

" 5068. In Suruga Gulf, Japan, 77-131 fathoms.

Three specimens.

**Pleurechinus variegatus** MORT.

*Pleurechinus variegatus* Mortensen, 1904. Dan. Exp. Siam: Ech., p. 84; Pl. 1, figs. 5, 6, 8, 19; Pl. 2, fig. 6.

This species is not readily distinguished from the preceding one unless at least a part of an interambulacrum is cleaned, yet the banding of the primaries, and the usual absence at their tips of a terminal thorn, are features of *variegatus* recognizable with a good lens. The specimens before us have scarcely a trace of red on the primaries, but they are not otherwise peculiar.

Station 4893. Southwest of Goto Islands, Japan, 95-106 fathoms.

" 4895. Southwest of Goto Islands, Japan, 95 fathoms.

" 5095. Off Gulf of Tokyo, Japan, 58 fathoms.

Three specimens.

**Prionechinus Agassizii** WOOD-MAS. and ALCOCK.

*Prionechinus Agassizii* Wood-Mason and Alcock, 1891. Ann. Mag. Nat. Hist., (6) 8, p. 441.

Our specimens agree so well with the description and figures of Döderlein (1906, p. 194; Pl. 24, fig. 1; Pl. 35, fig. 7) that there can be little question of their identity with his specimen. They show striking diversity in color, however, for while one is pure white, a second has the test pale brown and the very base of the spines tinged with olive, and the third has the tubercles and the basal half of all the larger spines pale red.

- Station 4965. Between Kobe and Yokohama, Japan, 191 fathoms.  
 " 4967. Between Kobe and Yokohama, Japan, 244-253 fathoms.  
 " 5086. Sagami Bay, Hondo, Japan, 292 fathoms.  
 Three specimens.

**Prionechinus ruber** A. AG. and CLARK.

This species may be recognized by the following combination of characters. The test and abactinal system show little evidence of sculpturing; the anal system is covered by ten to twenty plates, of which one is somewhat larger than the others; there are ten large buccal plates, each with a well developed tube-foot, and between these plates and the mouth the membrane is closely covered with small plates; the primary spines are nearly or quite smooth and rather sharply pointed; the test and basal half of the larger spines are red, while the tips of the spines and some of the tubercles are pure white. The larger specimen is 11 mm. in diameter.

- Station 4933. Off Kagoshima Gulf, Japan, 152 fathoms.  
 " 4967. Between Kobe and Yokohama, Japan, 244-253 fathoms.  
 Two specimens.

**Genocidaris apodus** A. AG. and CLARK.

This interesting species is easily recognized by the very large anal plate, the long primary spines which when unbroken exceed the diameter of the test, and the presence of only five large buccal plates, provided with a tube-foot. The second plate of each pair is rudimentary and carries no pedicel. There are no other plates on the buccal membrane. The test is very distinctly sculptured, but the abactinal system is nearly smooth and carries very few (15-25) small tubercles. The genital pores are large, in the centre of a slight elevation. The abactinal system is very large, its diameter sixty per cent or more of that of the test. The test and spines are white, but in the smallest specimen (the only one with unbroken spines) the terminal half of the longer primaries is red. The largest specimen is only 7 mm. in diameter.

- Station 4891. Southwest of Goto Islands, Japan, 181 fathoms.  
 " 4904. Southwest of Goto Islands, Japan, 107 fathoms.  
 Three specimens.

**TRIPLECHINIDAE** A. AG.

**Hemipedina mirabilis** DÖD.

*Hemipedina mirabilis* Döderlein, 1885. Arch. f. Naturg., Jahrg., 51, Bd. 1, p. 96.

The excellent series of specimens now before us confirms our recently expressed opinion (Bull. M. C. Z., 50, p. 245) that this species is quite distinct from *H. indica* de Meij.

- Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.  
 " 4808. Between Hakodate and Sado Island, Japan, 47 fathoms.  
 " 4900. Southwest of Goto Islands, Japan, 139 fathoms.  
 " 4933. Off Kagoshima Gulf, Japan, 152 fathoms.  
 " 4934. Off Kagoshima Gulf, Japan, 103-152 fathoms.  
 " 4965. Between Kobe and Yokohama, Japan, 191 fathoms.  
 " 5047. Between Hakodate and Yokohama, Japan, 107 fathoms.
- Thirty-seven specimens.

### *Phymosoma crenulare* A. Ag.

*Glyptocidaris crenularis* A. Agassiz, 1863. Proc. Acad. Nat. Sci. Phila., p. 356.  
*Phymosoma crenulare* A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 151.

The "Albatross" collected a single very fine specimen, 77 mm. in diameter, with the longest spines measuring about 55 mm., and three other much smaller specimens.

- Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.  
 " 5046. Between Hakodate and Yokohama, Japan, 82 fathoms.
- Four specimens.

### *Echinus lucidus* Dön.

*Echinus lucidus* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 97.

An excellent series of this species shows great diversity in the height of the test and in the length of the primary spines.

- Station 4917. Off Kagoshima Gulf, Japan, 361 fathoms.  
 " 4957. Between Kagoshima and Kobe, Japan, 437 fathoms.  
 " 4958. Between Kagoshima and Kobe, Japan, 405 fathoms.  
 " 4959. Between Kagoshima and Kobe, Japan, 405-578 fathoms.  
 " 4965. Between Kobe and Yokohama, Japan, 191 fathoms.  
 " 4980. Between Kobe and Yokohama, Japan, 507 fathoms.  
 " 5048. Between Hakodate and Yokohama, Japan, 129 fathoms.  
 " 5049. Between Hakodate and Yokohama, Japan, 182 fathoms.  
 " 5051. Between Hakodate and Yokohama, Japan, 399 fathoms.  
 " 5078. Off Omai Saki Light, Japan, 475-514 fathoms.  
 " 5079. Off Omai Saki Light, Japan, 475-505 fathoms.  
 " 5082. Off Omai Saki Light, Japan, 662 fathoms.  
 " 5083. Off Omai Saki Light, Japan, 624 fathoms.  
 " 5084. Off Omai Saki Light, Japan, 918 fathoms.  
 " 5088. Sagami Bay, Japan, 369-405 fathoms.

Fifty-six specimens.

## CLYPEASTRIDAE AGASSIZ.

## ECHINANTHIDAE A. AGASSIZ.

*Clypeaster virescens* DÖB.

*Clypeaster virescens* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 102.

The species of *Clypeaster* in this collection seem to represent but a single species (except possibly one of the very young ones), and we refer them with little doubt to this form, which Döderlein found not uncommon in Sagami Bay. They range from 14 to 114 mm. in length, and the largest is 108 mm. wide and 24 mm. high.

Station 4877. Eastern channel, Korea Strait, 59 fathoms.

" 4884. Between Nagasaki and Kagoshima, Japan, 53 fathoms.

" 4885. Between Nagasaki and Kagoshima, Japan, 53 fathoms.

" 4893. Southwest of Goto Islands, Japan, 95-106 fathoms.

" 4894. Southwest of Goto Islands, Japan, 95 fathoms.

" 4895. Southwest of Goto Islands, Japan, 95 fathoms.

" 4937. Kagoshima Gulf, Japan, 58 fathoms.

" 4948. Between Kagoshima and Kobe, Japan, 65 fathoms.

" 5071. In Suruga Gulf, Japan, 57 fathoms.

" 5095. Gulf of Tokyo, Japan, 58 fathoms.

Fourteen specimens.

## LAGANIDAE DESOR. (Emended.)

*Laganum fudsiyama* DÖB.

*Laganum fudsiyama* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 104.

A number of large Laganidae are apparently the adults of this species. They range from 50 to 71 mm. in long diameter.

Station 4965. Between Kobe and Yokohama, Japan, 191 fathoms.

" 4966. Between Kobe and Yokohama, Japan, 244-290 fathoms.

" 4967. Between Kobe and Yokohama, Japan, 244-253 fathoms.

" 5091. Off Gulf of Tokyo, Japan, 197 fathoms.

Thirty-one specimens.

*Laganum pellucidum* DÖB.

*Peronella (Laganum) pellucida* Döderlein, 1885. Arch. f. Naturg., 51, Bd. 1, p. 104.

Although the specimens available are bare tests, there can be no mistaking this easily recognized species.

Station 4885. Between Nagasaki and Kagoshima, Japan, 53 fathoms.

Two specimens.

**Laganum diploporum** A. Ag. and CLARK.

This interesting species resembles *strigatum* A. Ag. and Cl. in the form of the test and the shape of the petals. But the sutures between the plates are scarcely visible, and the color is commonly light green, often yellowish, sometimes brownish. The striking characteristic, however, is the presence of *six* genital pores, two of which are in the posterior interambulacrum. Of the 54 specimens with an uninjured abactinal system, 34 show the *six* pores plainly; of the remaining 20, 17 are under 20 mm. in length, and most of them have no genital pores, at least in the posterior interambulacrum. One specimen, 22 mm. long, has five small pores, but the one in the posterior interambulacrum is at the extreme right hand side of that area. A specimen 37 mm. long, and another 43 mm., apparently have only one pore in the posterior interambulacrum, but under the microscope it becomes evident that this pore is formed by the fusion of two. The steps in the history of such a fusion are all shown in the large series of specimens available. The great majority of the specimens are circular or nearly so, but some of the smaller ones are slightly elongated. The most elongated specimen measures 28 by 26 mm., while the largest ones are  $38 \times 38.5$ ,  $40 \times 42$ , and  $43 \times 42$ . The smallest is only 8 mm. in diameter.

Station 4885. Between Nagasaki and Kagoshima, Japan, 53 fathoms.

“ 4888. Between Nagasaki and Kagoshima, Japan, 71 fathoms.

“ 4893. Southwest of Goto Islands, Japan, 95–106 fathoms.

“ 4895. Southwest of Goto Islands, Japan, 95 fathoms.

“ 4902. Southwest of Goto Islands, Japan, 139 fathoms.

“ 4904. Southwest of Goto Islands, Japan, 107 fathoms.

“ 4933. Off Kagoshima Gulf, Japan, 152 fathoms.

“ 4934. Off Kagoshima Gulf, Japan, 103–152 fathoms.

“ 4937. Off Kagoshima Gulf, Japan, 58 fathoms.

“ 5055. Suruga Gulf, Japan, 124 fathoms.

“ 5070. Suruga Gulf, Japan, 108 fathoms.

“ 5092. Off Gulf of Tokyo, Japan, 70 fathoms.

Fifty-six specimens.

**SCUTELLIDÆ** AGASSIZ.**Echinarachnius excentricus** VAL.

*Scutella excentrica* Eschscholtz, 1829. Zool. Atl., Pl. 20, fig. 2.

*Echinarachnius excentricus* Valenciennes, 1846. Voy. Venus. Zooph., Pl. 10.

There is a good series of twenty-four specimens of this curious species from Union Bay, Bayne Island, British Columbia.

**Echinarachnius mirabilis** A. Ag.

*Scaphechinus mirabilis* Barnard Mss., A. Agassiz, 1863. Proc. Acad. Nat. Sci., Phila., p. 359.

*Echinarachnius mirabilis* A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 107.

There are numerous sand-dollars in the collection, which appear to belong to this species.

- Station 4786. Between Medni and Bering, Komandorski Islands, 54 fathoms.  
 " 4787. Between Medni and Bering, Komandorski Islands, 54-57 fathoms.  
 " 4794. Off East Coast of Kamchatka, 58-69 fathoms.  
 " 4795. Off East Coast of Kamchatka, 48-69 fathoms.  
 " 4796. Off East Coast of Kamchatka, 48 fathoms.

Sixty specimens.

## PETALOSTICHA HAECKEL.

### CASSIDULIDAE AGASSIZ.

#### NUCLEOLIDAE AGASSIZ.

#### *Echinolampas sternopetala* A. Ag. and CLARK.

This species may be at once recognized by its narrow apetaloid ambulacra, with moderately long, straight, unequal poriferous zones. The color is bright yellowish-green. Length, 47 mm.; width, 40 mm.; height, 21 mm. Unpaired ambulacrum (poriferous portion), 12 mm. long, 2.5 mm. wide at open end, with 27 pairs of pores in left zone and 30 in right; right anterior ambulacrum, 15 × 2.5 mm., with 27 pairs of pores in left zone and 37 in right; right posterior ambulacrum, 15 × 2.5 mm., with 32 pairs of pores in left zone and only 25 in right. Anal system covered mainly by three large plates.

Station 4934. Off Kagoshima Gulf, Japan, 103-152 fathoms.

One specimen.

### SPATANGIDAE AGASSIZ.

#### POURTALESIAE A. AGASSIZ.

#### *Pourtalesia laguncula* A. Ag.

*Pourtalesia laguncula* A. Agassiz, 1879. Proc. Amer. Acad., 14, p. 205.

A good series of specimens, up to 30 mm. in length, is at hand. There is also a posterior fragment of a much larger individual, in which the anal snout is dorsally flattened and 10 mm. wide. This individual was apparently over 50 mm. long and possibly represents an undescribed species.

Station 4766. Between Atka Island and Bowers Bank, Bering Sea, 1766 fathoms.

- " 4906. Southwest of Koshika Islands, Eastern Sea, 369-406 fathoms.  
 " 4911. Southwest of Koshika Islands, Eastern Sea, 391 fathoms.  
 " 4912. Southwest of Koshika Islands, Eastern Sea, 391 fathoms.  
 " 4913. Southwest of Koshika Islands, Eastern Sea, 391 fathoms.  
 " 4914. Southwest of Koshika Islands, Eastern Sea, 427 fathoms.  
 " 4915. Southwest of Koshika Islands, Eastern Sea, 427 fathoms.



Station 4968. Between Kobe and Yokohama, Japan, 253 fathoms.

" 5054. Suruga Gulf, Japan, 282 fathoms.

" 5055. Suruga Gulf, Japan, 124 fathoms.

" 5072. Suruga Gulf, Japan, 148-284 fathoms.

Fifty-six specimens.

### URECHINIDAE LAMBERT. (Emended. A. Agassiz.)

#### *Urechinus naresianus* A. Ag.

*Urechinus naresianus* A. Agassiz, 1879. Proc. Amer. Acad., 14, p. 207.

A series of *Urechinus*, ranging in length from 30 to 58 mm., does not seem to be distinguishable by any constant character from this cosmopolitan species.

Station 4766. Between Atka Island and Bowers Bank, Bering Sea, 1766 fathoms.

" 5030. 46° 29' 30" N. × 145° 46' E., 1800 fathoms.

Thirteen specimens.

#### *Cystechinus purpureus* A. Ag. and CLARK.

Although this species is nearly allied to the southern *Wyllivillii*, it is distinguished from that species by the more compact abactinal system, having only three genital pores, much smaller and wholly inconspicuous pedicels, and the much deeper purple color, which has little or no tendency to red. The genital plates are more or less approximately square, and the distance from the anterior pore to either of the posterior ones is not much greater than from one of the latter to the other. The test is much lower and the individuals are all smaller than the full-grown *Wyllivillii*. Although the tests vary considerably in relative height, the diversity is not so great as is shown in *Urechinus naresianus*, as figured in the "Challenger" Report (Plate XXX a) by A. Agassiz. The plates near the ambitus are very low, as in *Urechinus*, with which genus this species is an obvious connecting link. The largest specimen is 66 mm. long and 23 mm. high, while another not quite so long is 33 mm. high.

Station 4761. 53° 57' 30" N. × 159° 31' W., 1973 fathoms.

" 4766. Between Atka Island and Bowers Bank, Bering Sea, 1766 fathoms.

" 5030. 46° 29' 30" N. × 145° 46' E., 1800 fathoms.

Nine specimens.

### PALAEOPNEUSTIDAE A. AGASSIZ.

#### *Palaeopneustes fragilis* DE MEIJ.

*Palaeopneustes fragilis* de Meijere, 1903. Tijd. Ned. Dierk. Ver., (2) 8, p. 12.

All of the specimens are large and badly broken, but there is no doubt of their identity with this East Indian species.

- Station 4969. Between Kobe and Yokohama, Japan, 587 fathoms.  
 " 4970. Between Kobe and Yokohama, Japan, 500-649 fathoms.  
 " 5053. Suruga Gulf, Japan, 503 fathoms.  
 " 5080. Off Onai Saki Light, 505 fathoms.

Four specimens.

### *Linopneustes excentricus* DE MEIJ.

*Linopneustes excentricus* de Meijere, 1903. Tijds. Ned. Dierk. Ver., (2) 8, p. 13.

There is a good series of this Spatangoid, ranging from 24 to 84 mm. in long diameter.

- Station 4906. Southwest of Koshika Islands, Japan, 369-406 fathoms.  
 " 4907. Southwest of Koshika Islands, Japan, 406 fathoms.  
 " 4909. Southwest of Koshika Islands, Japan, 434 fathoms.  
 " 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4912. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4915. Southwest of Koshika Islands, Japan, 427 fathoms.

Eleven specimens and numerous fragments.

### *Meijerea excentrica* A. AG. and CL.

*Meijerea excentrica* A. Agassiz and Clark, 1907. Bull. M. C. Z., 50, p. 252.

One of the specimens is 100 mm. long, 80 mm. wide and 30 mm. high, and the abactinal system is 52 mm. from the anterior margin. The color of this specimen is a much deeper brown than that of smaller specimens and has a distinct reddish tinge.

- Station 4908. Southwest of Koshika Islands, Japan, 434 fathoms.  
 " 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4912. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4914. Southwest of Koshika Islands, Japan, 427 fathoms.  
 " 4956. Between Kagoshima and Kobe, Japan, 720 fathoms.

Two specimens and numerous fragments.

### *Meijerea plana* A. AG. and CLARK.

At first glance, the individual on which this species is based, might be considered a young specimen of the preceding, but more careful examination makes this seem impossible. The test is 28 mm. long, 22 mm. wide, 4 mm. high at the anterior margin and 9 mm. high at the posterior end, where it is abruptly truncate. The anal system is on this vertical posterior surface. The abactinal system is excentric, 15 mm. from the anterior margin. The actinostome is little sunken and there is practically no labrum. The subanal fasciole is not at all angular and encloses a space 6 mm. wide by 2 mm. high. The shape of the test

and the absence of a conspicuous labrum easily distinguish this species from *excentrica* to which it is otherwise very nearly allied.

Station 4919. Off Kagoshima Gulf, Japan, 440 fathoms.

One specimen.

### SPATANGINA GRAY.

#### *Spatangus Lütkeni* A. Ag.

*Spatangus Lütkeni* A. Agassiz, 1872. Bull. M. C. Z. 3, p. 57.

The specimens are well preserved but small.

Station 4807. Between Hakodate and Sado Island, Japan, 44-47 fathoms.

“ 5047. Between Hakodate and Yokohama, Japan, 107 fathoms.

Six specimens.

#### *Gymnopatagus magnus* A. Ag. and CLARK.

This fine new species is larger than any of the other members of the genus, our best specimen measuring 98 mm. long, 80 mm. wide, and 30 mm. high. It is much nearer to *valdiviæ*, the type of the genus, in the form of the test and petals, than are either of the Hawaiian species, but it differs strikingly from them all in the large number of primary tubercles within the fasciole, particularly in the posterior interambulaerum; the anterior interambulaera each have 25 to 35 tubercles, the lateral have 28 to 32, and the posterior has 25 to 30. The primary spines are 20 to 45 mm. long and almost perfectly smooth, though many show a few scattered, minute teeth and in some cases these are sufficiently numerous to form imperfect whorls. The test and primaries of the largest specimen are pale fawn-color with the numerous small spines lighter, almost silvery-white, but a specimen 80 mm. long is distinctly reddish, almost dull rose-red on some parts of the test.

Station 5032. Off Omai Saki Light, Japan, 662 fathoms.

“ 5083. Off Omai Saki Light, Japan, 624 fathoms.

Four specimens.

#### *Lovenia gregalis* ALCOCK.

*Lovenia gregalis* Alcock, 1893. Journ. Asiat. Soc. Bengal, 62, p. 175.

The *Lovenias* in this collection all belong to a single species and are more closely allied to *gregalis* than to any other species, although they do not agree in every detail with Alcock's description.

Station 4906. Southwest of Koshika Islands, Japan, 369-406 fathoms.

“ 4912. Southwest of Koshika Islands, Japan, 391 fathoms.

Five specimens.

**Pseudolovenia hirsuta** A. Ag. and CL.

*Pseudolovenia hirsuta* A. Agassiz and Clark, 1907. Bull. M. C. Z., 50, p. 255.

These specimens cannot be distinguished from those of the same size from Hawaii.

Station 4906. Southwest of Koshika Islands, Japan, 369-406 fathoms.  
Two specimens.

**Maretia tuberculata** A. Ag. and CLARK.

This species is not at all like *alta*, *elevata*, or *elliptica*, and although it is very similar to *planulata* in the form of the test and the petals, the latter are narrower and shorter than in that species. The striking character, however, is the presence of few, very large primary tubercles in the anterior and lateral interambulacra, like those of *alta*; there are 1-3 in the anterior and 3-4 in the lateral spaces. The absence of genital pores and the condition of the petals show that the specimen is immature but it is evidently not the young of any known species. The test is 26 mm. long and 22 mm. wide, and the general color is very light purplish-gray.

Station 4875. Eastern channel, Korea Strait, 59 fathoms.  
One specimen.

**Echinocardium australe** GRAY.

*Echinocardium australe* Gray, 1851. Ann. Mag. Nat. Hist., (2) 7, p. 131.

The only specimen is immature, 14 mm. long, and almost pure white.  
Station 4962. Between Kobe and Yokohama, Japan, 36 fathoms.  
One specimen.

**Echinocardium dubium** A. Ag. and CLARK.

The occurrence in the northwestern Pacific of an *Echinocardium* allied to *flavescens* and *pennatifidum* is interesting. This species is certainly very closely allied to these north Atlantic forms, the only differences worthy of note being in the form and position of the anal system and subanal fasciole. The posterior end of the test does not overhang the anal system at all, but the latter is flush with the test; its vertical diameter is noticeably longer than the transverse. The subanal fasciole is nearly circular and not at all pyriform. The color is pale brown with the numerous small spines almost white, when dry. The largest specimen is 31 mm. long.

Station 4965. Between Kobe and Yokohama, Japan, 191 fathoms.

“ 5047. Between Hakodate and Yokohama, Japan, 107 fathoms.

“ 5055. Suruga Gulf, Japan, 124 fathoms.

Three specimens.

## BRISSINA GRAY.

*Hemiaster gibbosus* A. Ag.

*Hemiaster gibbosus* A. Agassiz, 1879. Proc. Amer. Acad., 14, p. 210.

The large series collected range in size from 10 to 34 mm. long diameter, and many of them seem to be almost spherical.

- Station 4913. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4967. Between Kobe and Yokohama, Japan, 244-253 fathoms.  
 " 4968. Between Kobe and Yokohama, Japan, 253 fathoms.  
 " 4970. Between Kobe and Yokohama, Japan, 500-649 fathoms.  
 " 4971. Between Kobe and Yokohama, Japan, 649 fathoms.  
 " 4973. Between Kobe and Yokohama, Japan, 600 fathoms.  
 " 4977. Between Kobe and Yokohama, Japan, 544 fathoms.  
 " 5053. Suruga Gulf, Japan, 503 fathoms.  
 " 5054. Suruga Gulf, Japan, 282 fathoms.  
 " 5056. Suruga Gulf, Japan, 258 fathoms.  
 " 5083. Off Omai Saki Light, 624 fathoms.  
 " 5086. Sagami Bay, Hondo, Japan, 292 fathoms.  
 " 5087. Sagami Bay, Hondo, Japan, 614 fathoms.  
 " 5088. Sagami Bay, Hondo, Japan, 369-405 fathoms.  
 " 5093. Off Gulf of Tokyo, Japan, 302 fathoms.

Fifty-five specimens.

*Hemiaster globulus* A. Ag. and CLARK.

The largest *Hemiaster* collected differs so much from the large specimens of *gibbosus* that we consider it an undescribed species. The test is nearly globular, measuring 36 mm. in length, 35 mm. in width and 33 mm. in height. The posterior end is vertically truncate, while the plastron forms a broad rounded keel. The most striking character, however, is the narrowness of the petals and the length of the posterior pair. In *gibbosus*, the posterior petals are about three-fifths of the length of the lateral ones, while their width is about three-fourths of their own length. In *globulus*, the posterior petals are seven-tenths of the length of the lateral ones, and their width is less than half their own length. In all the specimens of the large series of *gibbosus* no connecting links between the two forms were found. The test is more thickly covered with tubercles and small spines in *globulus* than in *gibbosus*, but the color is not essentially different.

Station 4832. Between Nanao and Tsuruga, Hondo, Japan, 76-79 fathoms.  
 One specimen.

*Brissopsis luzonica* A. Ag.

*Kleinia luzonica* Gray, 1851. Ann. Mag. Nat. Hist., (2) 1, p. 133.

*Brissopsis luzonica* A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 95.

There are only a few specimens of this species but they are mostly well preserved.

- Station 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4968. Between Kobe and Yokohama, Japan, 253 fathoms.  
 " 5055. Suruga Gulf, Japan, 124 fathoms.  
 " 5083. Off Omai Saki Light, Japan, 624 fathoms.  
 " 5091. Off Gulf of Tokyo, Japan, 197 fathoms.  
 " 5092. Off Gulf of Tokyo, Japan, 70 fathoms.
- Eleven specimens.

### *Brissopsis Oldhami* Alcock.

*Brissopsis Oldhami* Alcock, 1893. Jour. Asiat. Soc., Bengal, 62, p. 6 (174).

A large series of this species was taken.

- Station 4906. Southwest of Koshika Islands, Japan, 369-406 fathoms.  
 " 4907. Southwest of Koshika Islands, Japan, 406 fathoms.  
 " 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4912. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4913. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4915. Southwest of Koshika Islands, Japan, 427 fathoms.  
 " 4956. Between Kagoshima and Kobe, Japan, 720 fathoms.  
 " 4957. Between Kagoshima and Kobe, Japan, 437 fathoms.  
 " 4966. Between Kobe and Yokohama, Japan, 244-290 fathoms.  
 " 4970. Between Kobe and Yokohama, Japan, 500-649 fathoms.  
 " 4980. Between Kobe and Yokohama, Japan, 507 fathoms.  
 " 5053. Suruga Gulf, Japan, 503 fathoms.  
 " 5054. Suruga Gulf, Japan, 282 fathoms.  
 " 5082. Off Omai Saki Light, Japan, 662 fathoms.  
 " 5087. Sagami Bay, Hondo, Japan, 614 fathoms.  
 " 5088. Sagami Bay, Hondo, Japan, 369-405 fathoms.
- Seventy-three specimens.

### *Aërope fulva* A. Ag.

*Aërope fulva* A. Agassiz, 1898. Bull. M. C. Z., 32, p. 81.

We refer the fragments of an *Aërope*, of a bright yellow-brown color, to this Pauamic species.

Station 4766. Between Atka Island and Bowers Bank, Bering Sea, 1766 fathoms.

Two specimens (anterior fragments only).

### *Aceste purpurea* A. Ag. and Cl.

*Aceste purpurea* A. Agassiz and Clark, 1907. Bull. M. C. Z., 50, p. 259.

The specimens of *Aceste* collected belong to this Hawaiian species.

- Station 4911. Southwest of Koshika Islands, Japan, 391 fathoms.  
 " 4913. Southwest of Koshika Islands, Japan, 391 fathoms.

Three specimens.



**Schizaster japonicus** A. Ag.

*Schizaster japonicus*, A. Agassiz, 1879. Proc. Amer. Acad., **14**, p. 212.

There is an excellent series of this species, ranging from 15 to 60 mm. in length.

- Station 4939. Kagoshima Gulf, Japan, 85 fathoms.  
 " 4940. Kagoshima Gulf, Japan, 115 fathoms.  
 " 4942. Kagoshima Gulf, Japan, 118 fathoms.  
 " 4943. Kagoshima Gulf, Japan, 119 fathoms.  
 " 4945. Kagoshima Gulf, Japan, 70 fathoms.  
 " 4961. Between Kobe and Yokohama, Japan, 33 fathoms.  
 " 4962. Between Kobe and Yokohama, Japan, 36 fathoms.  
 " 4964. Between Kobe and Yokohama, Japan, 37 fathoms.

Thirty-one specimens.

**Schizaster ventricosus** GRAY.

*Schizaster ventricosus* Gray, 1851. Ann. Mag. Nat. Hist., (2) **7**, p. 133.

A remarkably interesting series of this species was taken, ranging from 9 to 74 mm. in length. There is the greatest diversity, shown in the relative length of the anterior and posterior petals and in the angle made by the latter with the longitudinal axis of the body. While it is possible to divide the specimens into three groups, (1) with short, widely diverging, posterior petals, (2) with long, straight, little diverging, posterior petals, and (3) with very long petals, the posterior pair straight and moderately diverging) it is impossible to draw hard and fast lines between such groups, and although the typical examples of each group are obviously different from each other, it seems best to regard them all as *ventricosus*.

- Station 4748. Off Bushy Point, near Yes Bay, Alaska, 185-300 fathoms.  
 " 4768. Bowers Bank, Bering Sea, 764 fathoms.  
 " 4775. Bowers Bank, Bering Sea, 584 fathoms.  
 " 4832. Between Nanao and Tsuruga, Hondo, Japan, 76-79 fathoms.  
 " 4842. Off Dogo Island, Sea of Japan, 82 fathoms.  
 " 4968. Between Kobe and Yokohama, Japan, 253 fathoms.  
 " 4993. Between Otaru, Japan and Korsakov, Saghalin Island, 142 fathoms.  
 " 5015. Off east coast, southern end of Saghalin Island, 510 fathoms.  
 " 5029. 48° 22' 30" N. × 145° 43' 30" W., 440 fathoms.  
 " 5032. Yezo Strait, Japan, 300-533 fathoms.  
 " 5033. Yezo Strait, Japan, 533 fathoms.  
 " 5036. Off south coast of Hokkaido, Japan, 464 fathoms.  
 " 5037. Off south coast of Hokkaido, Japan, 175-349 fathoms.  
 " 5039. Off south coast of Hokkaido, Japan, 269-326 fathoms.  
 " 5040. Off south coast of Hokkaido, Japan, 140-269 fathoms.  
 " 5045. Off south coast of Hokkaido, Japan, 359 fathoms.  
 " 5046. Between Hakodate and Yokohama, Japan, 82 fathoms.  
 " 5047. Between Hakodate and Yokohama, Japan, 107 fathoms.

- Station 5049. Between Hakodate and Yokohama, Japan, 182 fathoms.  
 " 5051. Between Hakodate and Yokohama, Japan, 399 fathoms.  
 " 5053. Suruga Gulf, Japan, 503 fathoms.  
 " 5054. Suruga Gulf, Japan, 282 fathoms.  
 " 5055. Suruga Gulf, Japan, 124 fathoms.  
 " 5056. Suruga Gulf, Japan, 258 fathoms.  
 " 5059. Suruga Gulf, Japan, 197-297 fathoms.  
 " 5067. Suruga Gulf, Japan, 293 fathoms.  
 " 5072. Suruga Gulf, Japan, 148-284 fathoms.  
 " 5087. Sagami Bay, Hondo, Japan, 614 fathoms.  
 " 5088. Sagami Bay, Hondo, Japan, 369-405 fathoms.  
 " 5091. Off Gulf of Tokyo, Japan, 197 fathoms.  
 " 5092. Off Gulf of Tokyo, Japan, 70 fathoms.  
 " 5093. Off Gulf of Tokyo, Japan, 302 fathoms.

Two hundred and seventy-five specimens.

#### *Periaster rotundus* A. AG. and CLARK.

This species is extraordinarily like *limicola* from the Gulf of Mexico, as it has two genital pores and the general shape of the test is of that species. The posterior petals are shorter in *rotundus* (just one-half the lateral ones, instead of nearly two-thirds as in *limicola*) and have fewer pairs of pores relatively (less than 65 per cent of the number in the lateral petals instead of over 75 per cent as in *limicola*). The mouth is nearer the centre of the actinal surface in *rotundus* (two-fifths of the long axis from the anterior end, instead of one-third as in *limicola*). The test is 37 mm. long, 35 mm. wide, and 31 mm. high. The color of the test is pale brown, and the numerous spines are silvery-white (dry).

Station 4946. Between Kagoshima and Kobe, Japan, 39 fathoms.

One specimen.

#### *Periaster fragilis* A. AG. and CLARK.

The specimen upon which this species is based is obviously immature, and has no genital openings. At first sight it might be mistaken for a young *Schizaster*; but comparison with specimens of *S. japonicus* and *S. ventricosus* of the same size and smaller shows at once that such is not the case. In young *Schizasters* the area occupied by the petals and peripetalous fasciole covers most of the abactinal surface, the abactinal system is far back of the center, and the anterior ambulacral furrow is already deep. None of these characters are found in the specimen under discussion. That it is not the young of the preceding species is shown by the extraordinary shortness of the posterior petals, the narrower, flatter test, and the character of the actinostome. The test is 16 mm. long, 14 mm. wide, and 10 mm. high. The lateral petals are 5.3 mm. long and have 18 pairs of pores,

while the posterior petals are 2 mm. long and have only 7 pairs of pores. The labial plate is short and in contact with only one ambulacral plate on each side, and the actinostomal membrane carries only very small plates, while in *rotundus* the labial plate is long and in broad contact with two ambulacral plates on each side, and the actinostome is covered by four large and six or seven smaller plates. We are forced, therefore, to regard this specimen as a young example of an undescribed species. The test and spines are nearly white, while the peripetalous fasciole is purple.

Station 4913. Southwest of Koshika Islands, Japan, 391 fathoms.

One specimen.